Repair, Recycle or Re-use?

Creating mnemonic devices through the modification of object biographies during the Late Bronze Age in Switzerland

Keywords

Late Bronze Age; Switzerland; Razors; Metalwork; Recycling; Mnemonic devices; Arm-/Leg-rings

Introduction

The many thousands of known metal artefacts - mainly bronze - relating to the Bronze Age in Europe have not only been utilized in type-chronologies, but also led to high levels of interest in prehistoric metallurgy. This interest has mainly focused on manufacturing techniques and technology (Tylecote 1992; Bradley 1988; Young et al. 1999), while archaeometric analysis has often been utilized in attempts to identify metal ore sources and alloying techniques (e.g. Rychner & Kläntschi 1995). In recent years the 'biographical' approach (cf. Appadurai 1986; Gosden & Marshall 1999) has been applied to investigations of the manufacture of metal-work objects in conjunction with their utilization and deposition (Fontijn 2002; Ottaway 2001; Ottaway & Roberts 2008; Roberts 2009). Such biographical approaches have considered the manufacture of objects from the selection of ore through to their casting and working, before turning to the social implications of their use and deposition (Fig. 1).

The potential to recycle metalwork by melting objects and re-casting them into new ones is frequently mentioned in these biographies, though it is almost impossible to observe in the archaeological or archaeometric record (though see Rychner & Kläntschi 1995). Unlike the recycling of other prehistoric material, such as pottery which may have been used as temper in other ceramics (e.g. Woodward 2002; Brück 2006, 304), the recycling - i.e. melting and recasting - of metal leaves very little (or no) trace in the archaeological and archaeometric record (though see Caple 2010). In contrast, the modification of metal objects, through shaping, cutting and hammering, to create new objects is evidenced at several locations throughout Europe, and several examples of direct conversion are known from Late Bronze Age contexts in Switzerland. Such modification may also leave little evidence in the archaeometric record, but is more visible in the archaeological/typological one.

Despite the difficulties in observing recycled metal in the material record, an extensive archaeometric study of Late Bronze Age (LBA) metalwork from Switzerland (Fig. 2), and substantial catalogues of artefact groups from the region make this area an excellent case study for the re-use and/or recycling of materials.

Previous studies of Bronze Age metalwork from Switzerland

In an isotopic and chemical composition study of Bronze Age metalwork material culture from Switzerland, Rychner and Kläntschi (1995) analysed over 900 objects. The artefacts, primarily axes, knives and sickles (combined 82% of analysed objects) have a temporal range from the Middle Bronze Age (BzB) to the end of the Late Bronze Age (HaB2/B3) (see Fig. 3) and were recovered, primarily, from lake-settlement contexts. Through the trace element analysis of copper and the analysis of included impurities, Rychner and Kläntschi (1995) were able to make several significant conclusions regarding metallurgical practices in the region. Essentially, a new (different) copper source was utilized between BzD and HaA1, which contained higher levels of lead, nickel, silver, antimony and cobalt than previous eras. Between HaA2 and HaB2/B3 several different copper sources may have been used, though generally different to those utilized during BzD/ HaA1 (Rychner & Kläntschi 1995, 57-61). The study of impurities included in the bronze objects permitted the observation that objects from each period possessed specific levels of impurities, with clearly definable and internally homogenous metal groups. Evidently, objects were not melted down, recycled and recast into new objects over extended periods of time, e.g. between BzC and BzD or HaB1 and HaB2/B3, but deposited at the end of their social/use life, while new objects were manufactured from new metal stock (Rychner & Kläntschi 1995, 83).

Although several objects were identified as having been made from ancient bronze, following the re-melting – re-casting process, including axes from Ollon-Charpingy and Geneve-Eaux Vives, they represent less than 0.5% of the analysed material. Distributional differences in impurity groups of material from eastern, central, and western Switzerland provide further confirmation of the limited circulation of manufactured bronze work between these regions during the LBA, as has been noted in the distribution of typological forms and decorative designs (e.g. Rychner 1979, Maps 1-14). The widespread use of similar copper types, however, suggests that copper ingots were widely circulated for utilization in local manufacturing processes. In addition to the identification of different metal composition over time, the study was able to identify objects with such similar impurity levels that they could be considered as manufactured in the same casting process, or sufficiently similar copper profiles that they were identified as being manufactured from the same copper ingot. Unsurprisingly, many of these objects were found in the same location, though some were from different sites within the broad regions (east/centre/west) with few links found between the areas, indicating trade and exchange links (Fig. 4).

Objects imported to the northern Circum-Alpine region have been identified through compositional analysis, for example in an early Iron Age burial at Bischofshofen-Pestfriedhof (Northover 2009), though the occurrence of foreign forms of metalwork during the LBA is relatively low in the region discussed here, and those are usually identifiable through typological studies (e.g. 'foreign' type sickles (Primas 1986), razors (Jockenhövel 1971)). However, two Late Bronze Age Jenišovice-Kirkendrup type cups analysed by Rychner and Kläntschi (1995, no. 743, 4) show chemical patterns similar to that for local type objects from Switzerland, suggesting that these cups, common in both northern Europe and the Circum-Alpine region, were manufactured locally (Thrane 1975; Patay & Petres 1990).

Distribution of ring jewellery and razors

Extensive, and relatively up-to date, catalogues of various Bronze Age material culture groups are available for Switzerland, and the northern Circum-Alpine region. Many of the artefacts listed in these catalogues are known from 'excavations' of pile-dwellings during the latter 19th and early 20th centuries, and also incorporate much of the material recovered during archaeological investigation during the second half of the 20th century. Catalogues covering swords (Quillfeldt 1995; Schauer 1971; Krämer 1985), arm- and leg-rings (Pászthory 1985), sickles (Primas 1986), horse equipment (Hüttel 1981) and razors (Jockenhövel 1971) have been published in the *Prähistorische Bronzefunde* (PBF) series since the 1970s. Some significant excavations which occurred after the publication of the relevant catalogue are those of Hauterive-Champréveyres (metalwork in Rychner-Faraggi 1993), and numerous excavations along the route of motorways, such as the A1 along the side of Lake Neuchâtel and Lake Murten (Boisaubert et al. 2008). Two major classes of artefact not detailed under the PBF series for Switzerland are knives and spearheads. The latter of these have been catalogued by Tarot (2000) in a standalone volume, while no collated work for knives exists. Rychner (1979) has, however, created a typological chronology of knife forms for the LBA based upon numerous finds from lake-settlements.

The artefact catalogues, and also the archaeometric analysis of Rychner and Kläntschi (1995, see above) provide a clear indication that relatively little circulation of objects occurred between eastern and western Switzerland. The two regions appear to have utilized locally specific objects, and have been connected to different regions of Europe: eastern Switzerland to southern Germany and western Switzerland to the Middle Rhine Valley.

Clay and stone moulds for objects from each of these material categories, and other metal working tools and equipment, such as hammers and chisels from many lake-settlements, and an anvil from the pile-dwelling Zurich-Wollishofen Haumesser (Heierli 1886, 13), all provide indications for metal-working and manufacture in the pile-dwellings of Switzerland. Concerning the re-use and recycling of metal, evidence is less clear. However, an ‘old metal clump’ from Grandson-Corcelettes, consisting of arm-/leg-rings, spear heads, winged axes, and sickles in a half molten form (Wyss 1967, 12), deformed artefacts from Auvernier-Nord (Rychner 1984, 76), and part molten ring jewellery from Font-La Pianta and Zurich-Grosser Hafner (Pászthory 1985, No. 620, 1, 1032) suggests that assorted objects may have collected to meltdown and re-use (see Fig. 2 for locations). Bronze slag waste from Grandson-Corcelettes or Yvonand provides further indication of the manufacture of objects at lake-shore settlements (Rychner 1984, 76), though not indications of the recycling of metal.

The metal conglomerate from Grandson-Corcelettes contains a pair of Cortaillod type arm-/leg-rings and a pair of ribbed (German: *gerippte*) rings. The distribution of the Cortaillod types of ring jewellery is centred on the lake-dwellings of western Switzerland, in particular around Lake Neuchâtel (Fig. 5). In addition, the ribbed spearhead and sickle within this agglomerate material is similar to many others found within the northern Circum-Alpine region during the LBA. Other instances of molten ring jewellery occur at the Zurich-Grosser Hafner and Font-La Pianta lake-

settlements; these are again of types that are well documented from the northern Circum-Alpine region (Pászthory 1985).

Clearly, objects were not being converted from imported objects into bronze stock, via melting, to produce locally relevant objects (Fontijn 2002, 248; Roberts 2009, 13); instead, locally manufactured objects were being recycled at a low rate of consumption (seven objects from a catalogue of 2234 items (Pászthory 1985)). Such conversion of 'foreign' to 'local' ('secondary local') objects may be of more relevance in northern Europe, Fontijn's region of study, where the import of metal objects was the primary method of obtaining metal. In the Alpine region, much closer to metal ore producing areas, such conversion may not have been required as copper and tin could have been circulated in 'raw' ingot form, ready for manufacture into 'primary local' objects.

In addition to charting the distribution of razor types within Europe, the catalogues of Jockenhövel (1971; 1980) demonstrate a second form of metal recycling within the northern Circum-Alpine region: direct conversion of one object into another. Based upon decorative motifs, several razors from Late Bronze Age lake-dwelling contexts were recognized as being cut from hollow arm-/leg-rings and hammered into the razor shape (Fig. 6). Direct conversion recycling or re-use is apparently an unusual occurrence (given the low quantity of objects known), partly because there are only certain objects that have properties sufficient for easy conversion without melting and casting. In the case of razors, this requires objects which are relatively thin, but also broad enough to enable a sufficient width of blade to be achieved. Of the examples recorded by Jockenhövel (see Table 1), five display decoration identifiable as typical of Corcelettes type ring jewellery, while a sixth shows decoration of a Boiron type arm-/leg-ring. These rings are common to the northern Circum-Alpine region (Figs. 7-8), especially western Switzerland, while the form of razor into which they were converted is found in the same area (Jockenhövel 1971). Examples of two sided razors cut from belt buckles and dagger blades are also known from Austria, razors converted from hanging ornaments are known in France, and several examples of atypical razors cut from undecorated, un-identifiable plate work are also known from Switzerland (Jockenhövel 1980; Jockenhövel 1971). A spearhead which may have been cut from a sword blade is also known from Mörigen (Tarot 2000, No. 421).

It is somewhat self-evident that objects which displayed properties similar to the desired form of the new object were selected for modification; the conversion of a sword blade into a spear head would be relatively simple, while hollow ring jewellery would have been of sufficient dimensions and thickness to make a razor.

While many arm- and leg-rings are found in a fragmentary state, for example circa 50% of the Corcelettes and 44% of Mörigen rings detailed by Pászthory (1985), it is clear that breakage of an object did not equate to the end of their use life. In addition to those objects that were converted into razors, several instances of repair to broken or cracked rings are observed (Table 1, Fig. 9). Small holes were drilled through either side of a damaged area and then secured with wire, allowing the object to continue its life and utilization in social practices. It is not clear when damage to these objects occurred, at the manufacturing stage or during their use life. However, repair of these objects may have required metal workers, not only for their skills but also their equipment and materials. If such repairs were undertaken by metalworkers, then the question must be asked why the object was repaired instead of being melted and manufactured into a new object.

Why convert objects?

The vast majority of both arm-/leg-rings and razors known from the northern Circum-Alpine region are from lake-settlement contexts. Outside of the lake-dwelling region some rings are known from hoards, particularly in eastern France, and burials, in Germany and occasionally Switzerland. However, recovery from lake-settlement contexts does not mean that an object was casually discarded or lost in a settlement during its life. For instance, an intra-settlement hoard at Auvernier-Nord contained 22 examples of the Corcelettes type ring (Pászthory 1985), demonstrating that meaningful and intentional deposition occurred within the lake-settlements. Other hoards within lake-settlements may not have been recognized at their time of excavation – especially sites 'recorded' in the ninteenth century (Fischer 2011; Fischer 2012; Primas 1977, 53; Menotti 2012, 3). Given their high frequency of occurrence, highly ornate decoration and presence in hoards and burials, ring jewellery clearly performed a significant role in the social display of Late Bronze Age communities in the NCA and further afield. In contrast, razors are an extremely uncommon occurrence in burial and hoard contexts from the northern Circum-Alpine region; over 95% of the examples recorded from Switzerland are single items from lake-dwelling contexts (from catalogue of Jockenhövel 1971). In addition, the proportion of decorated razors is quite low (c. 20%), and when decoration does occur, follows no repetitive patterns or schemes which can be observed on other forms of material culture (e.g. ring jewellery and knives) (see Jockenhövel 1971). When compared to razors from the Nordic region (Kaul 2004; Kaul 1998), there is evidently a marked difference in the symbolism and importance associated with razors and shaving/grooming. Thus, through the conversion of ring jewellery into razors within the region lake-dwelling communities of Switzerland highly socially charged objects were being transformed into, given their typical un-structured deposition and low decoration rates, objects which may have possessed relatively little social value and symbolism.

Explanations for such transformation can be categorized as either practical recycling of material, or social actions designed to continue the circulation or objects. Practical recycling of material would occur when objects were broken, and instead of wasting the fragmented bronze, they were converted into a required object – in these instances razors. However, as has been mentioned above, several instances of arm- and leg-rings with repairs are known from the NCA, indicating that ring jewellery was not necessarily discarded or reached the end of its biography when they became damaged (Martin 2012). Modification into other objects may have offered a route to extend this biography even further, though how damaged/broken these objects must have become for consideration of conversion to be undertaken is unknown. Such conversion could have been undertaken by the owners of the broken object using improvized equipment, or metal workers who would have possessed the equipment (chisels, hammers, and anvils) and skills to undertake the work. If the conversion was undertaken by 'specialized' metalworkers, why were the fragments not melted down to cast new objects? A significant amount of bronze would have been surplus after cutting a razor from a ring, or fragment thereof, which would most likely have been converted into other objects instead of simply being discarded. Yet, due to the low representation of ring-razor hybrids, evidently not all of the fragments were converted into razors.

Retention of objects and their continued circulation and use over extended periods of time could have been achieved through the conversion of one item into another, effectively creating

'heirlooms' from older objects. However, it is evident that the 'parent' ring jewellery and 'child' razor are roughly contemporary, although the typological chronology used to classify these objects does not carry the same dating resolution as many of the dendrochronologically dated lake-dwellings, and specific styles are identified only to c. 100 – 150 years, equating to several generations of potential owners. The retention of ancient objects in Late Bronze Age lake-dwelling communities has been demonstrated through a study of metalwork assemblages from around the lakes of western Switzerland (Fischer 2011; Fischer 2012). Although these objects only account for a minority of the assemblage, they are notable by their presence at Mörigen Geneve-Eaux Vives, and Auvernier-Nord.

The use of heirlooms as a method of generating social identities, identity retention and social legitimization has been discussed for societies inhabiting various areas of Europe (e.g. Woodward 2002; Lillios 1999; Denison 2000; Caple 2010), not only with regard to objects of material culture, but also human remains (Shapland & Armit 2012). Interestingly, human remains, particularly skull fragments, have been recovered from several LBA lake-dwellings (Andrey 2006; Baumeister 2009), though their burial practices, with the exception of cemeteries at Lausanne (Moinat & David-Elbiali 2003) and Le Boiron (Beeching 1977), remain largely unknown. Retention of objects, albeit transformed into new pieces, could have provided a link to the past and other members of communities. Converted objects deviate from the generally accepted biography of metalwork objects (Fig. 1), as detailed by Ottaway (2001) and Fontijn (2002) in that they do not enter the archaeological record (or re-melting process) at the appropriate stage; they are extracted from the system and re-circulated as a new object while retaining direct reference to their past biography through their residual decoration inherited from the parent object (Fig. 10). The decoration apparent on the arm-ring-razors clearly identifies them as being manufactured from sections of ring-jewellery; no other artefacts of the Late Bronze Age have such rich decoration on their surface. This is readily apparent to archaeologists today, and would have been even more so to individuals living in the Late Bronze Age and viewing these objects during social practices. The decoration would have been relatively easy to remove, or at least subdue, through metalworking practices if this had been desired, though evidently this was not the case. Whoever made these razors clearly intended that the decoration should be visible, apparent and identifiable on the surface of the object.

Motivations for the incorporation and display of residual decoration may include the retention of items belonging to absent (through either death of relocation) members of society. The use of personal jewellery, albeit in a new form, may have acted as a continuation of social presence and action; effectively a way of remembrance through mnemonic devices (cf. Chapman 2000; Chapman & Gaydarska 2007; Skeates 2010; Caple 2010). Contrastingly, the physical destruction of an object, and continual sign and visibility of that destruction through its presence in another form, could have formed a sense of individual/personal or communal 'forgetting' – deliberately signifying that an object, and what that object represented, no longer exists (cf. Jones 2007). Alternatively, the conversion of one object into another may have symbolized progression through various life-stages of a single individual, with the conversion occurring at socially significant stages. Due to the low number of burials known that are related to lake-dwelling settlements and communities, gender associations are difficult to identify for the ring jewellery of the Late Bronze Age. Moreover, outside of the region, ring jewellery is known from both male and female burials (e.g. Kubach-Richter 1981; Richter 1970), so conversion from ring to razor does not need to be considered a 'cross-gender' event.

If an interpretation following 'Occam's razor' (the principle of parsimony), is preferred, under which the simplest explanation is considered the best one, then the utilization of broken objects for conversion into new ones must be accepted. However, as has been detailed above, this practice seems unlikely given: a) the repairs seen on several arm-rings; b) the apparent abundance of undecorated bronze plate work in circulation during the LBA (indicated by the numbers of plain plate razors); c) the opportunity to re-melt and re-cast the object (e.g. Grandson-Corcelettes agglomerate); d) the coincidence needed for a razor to be required while having a broken ring available; and e) the fact that 'simple' or 'logical' actions are not always followed. Social factors should be considered as the driving influence for the choice to convert these objects, and not simply economy of material.

'Ancestor cult' or the individualization of objects?

Given the low occurrence of converted objects in the Late Bronze Age, these ring-razors should not be seen as a sign of an 'ancestor cult' or 'ancestor worship' or widespread practices of heirloom creation. Such 'ancestor' practices and creation of heirloom objects would likely have revolved around objects with highly socially charged meanings, evident in their inclusion in such social actions as burials. The symbolic use of ancestral objects, relations and origins in the present through ritual actions, practices, and locations has been considered as one of the key chiefly strategies of legitimization and control during the Bronze Age (Kristiansen & Larsson 2005, 45; Harding 2000, 74). Such practices in the northern Circum-Alpine region may have utilized the arm-/leg-rings themselves; with highly ornate decoration and frequent internal markings (which may represent makers' marks, owners' marks, or illustrate the sequence in which rings should be combined (e.g. Rychner-Faraggi 1993, 52; Hagl 2008, 38)), these objects would be easily identifiable. Although many rings shared similar schemes of decoration, subtle differences in the internal patterns may have made them identifiable as individual rings, linking them to specific individuals and merging their identities. While ring jewellery was occasionally included in burials (e.g. Le Boiron, Vidy-Chavannes), the high numbers of these objects known suggests that they were relatively abundant in society, making their use as elite ancestral legitimation devices somewhat limited. Furthermore, the individual identification of the rings may only be possible when the whole pattern is visible, not only a small section cut from the larger whole. Thus, secondary object razors should not, necessarily, in this situation, be seen as attempts to legitimize social status or practices over several generations.

Instead, it is suggested that these ring-razors provide an excellent example of 'singularized objects' (Kopytoff 1986, 73-83); objects which were given meaning by their owners, and which ties them closely to the object, but is not evident to other members of a community. The removal of these rings from one sphere of valuation with well-defined social biographies from production to deposition, and insertion to another with a less clearly defined biography, created an extension to the biography of the first object. Deposition of these objects with extended biographies, and razors in general within the northern Circum-Alpine region, do not occur in burials or other structured depositions during the Late Bronze Age; their use as objects of social identity creation was apparently very limited. Thus secondary ring-razors should be interpreted as mnemonic devices, as

personal ‘mementos’ created from individualized objects, for use in either private or public grooming practices. While potential observers of these secondary razors would have easily recognized the original source of decoration adorning their surface (ring jewellery), due to the fragmentation of the motif it is doubtful that they would have recognized social associations of the object if they were not aware of the actual act of conversion.

The possible sword-spearhead from Mörigen (Tarot 2000) represents, for instance, a clear diversion from the typical biography of swords during latter stages of the Late Bronze Age, during which they were either deposited as intact objects in wetland (river/moor) contexts, or as fragmentary pieces in hoards and burials (Krämer 1985; Roymans 1991; Schauer 1971; Torbrügge 1972). Conversion of sword fragments may represent an attempt to access past ancestral claims to power, through the re-use of elite weapons (Kristiansen & Larsson 2005, 231), possibly after their recovery from burials or hoards, in contemporary contexts. How identifiable as individual weapons belonging to certain persons’ sections of sword blade may have been is debatable, and it should also be noted that upper sections of sword blades are outnumbered by sections including the hilt at a rate of five to one in burials and hoards from the northern Circum-Alpine region (see Bradley 2005, 154-5). Although only a single instance of sword conversion is recorded here, it should be noted that extended biographies of swords have also been observed through the re-use of both blades and hilts during the Late Bronze Age in other areas of the Circum-Alpine zone (Mödlinger 2011).

Conclusion

Studies of Late Bronze Age metalworking practices often emphasise the role of recycling old, broken, and surplus metal objects through an effectively invisible process of ‘primary recycling’: re-melting and re-casting (Fontijn 2002; Ottaway 2001). Frequent findings of so-called ‘founders hoards’ provide support for such interpretations in the form of collections of materials stockpiled in advance of recycling (Harding 2000, 354), and an agglomerate mass of half molten objects from the lake-settlement Grandson-Corcelettes (Wyss 1967) provides a direct indication of such activities in the northern Circum-Alpine region. However, in the light of archaeometallurgical studies (Rychner & Kläntschi 1995), how widespread such primary recycling was in the northern Circum-Alpine region must be questioned. Practices of ‘secondary manufacture’, or the direct conversion of one object into another are evidenced in the lake-dwellings of Switzerland through bronze plate razors bearing decoration typical of various regional types of ring jewellery.

Recycling practices utilizing direct conversion, rather than total destruction through re-melting, permit the object’s biography to be extended through time, beyond the use period of one object into a second, while visibly retaining the biographical associations contained within the primary object. Such extended biographies have elsewhere been considered as practices of heirloom creation and the presencing of ancestors in the present (e.g. Lillios 1999; Woodward 2002). However, the low occurrence of these converted arm-ring-razors and their rough temporal contemporaneity suggests that they were not part of widespread social practices intended to create ancestral links, but rather that they were ‘individualized’ objects selected for retention by their

owners. In this manner, the razors could have been utilized as personal mnemonic devices to recall other places, times, individuals, or events. In addition to extending the biography of ring jewellery into another regime, an effective social devaluation of the object occurred: from the richly decorated arm-/leg-rings, which were often included in burials as identity or status generating objects to typically undecorated razors, which were seldom included in burial assemblages within the northern Circum-Alpine region.

While secondary recycling/conversion of objects may be more visible than the primary recycling/melting of objects, it is still dependent upon recognisable features being present on the objects. The examples of razors cut from arm-rings are only identifiable as being so because of the decoration visible on their surface. Had this decoration been removed during the conversion process, through hammering or grinding, then it would have been impossible to identify the source of the metal plate work. Many of the Late Bronze Age single sided razors from the northern Circum-Alpine region were cut from bronze plate work, though the source of this plate remains unknown because the razors do not show any typological features of decoration present on other objects. The occurrence of 'relic' objects in lake-settlements of the Late Bronze Age in western Switzerland provides indications that objects were being curated over extended periods of time within this region (Fischer 2011; 2012), and by the same societies that were creating secondary manufactured objects, as the individualization of specific objects by community members to place past identities ('ancestors', recent individuals, social life-stages) in the present.

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Figures & Captions

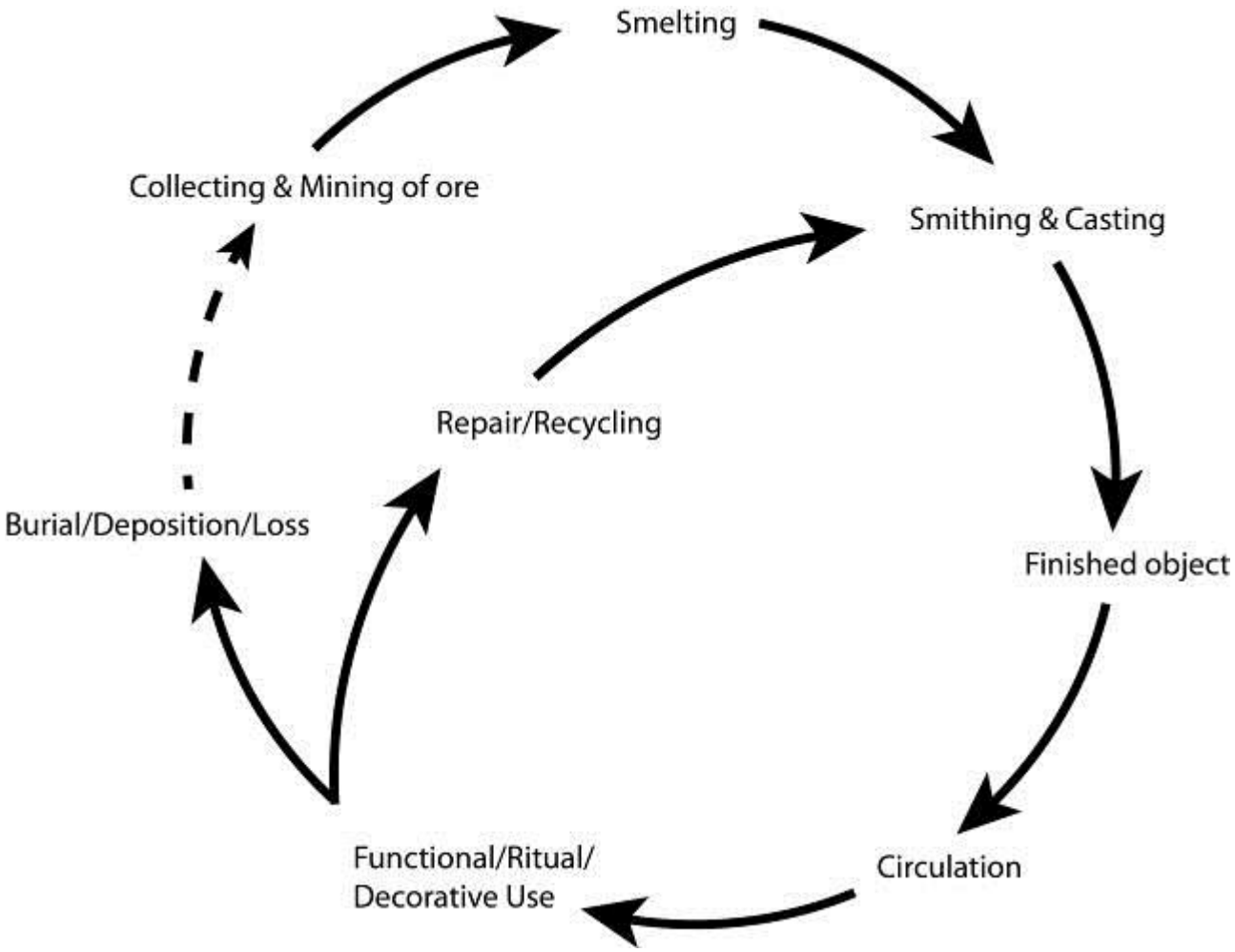

Figure 1. *Biographical cycle of metal work from production to deposition. Processes of ultimate destruction and re-incorporation of the metal elements into the environment described by Ottaway (2001) have been summarized in the dashed line. (Modified from Ottaway 2001 and Fontijn 2002).*

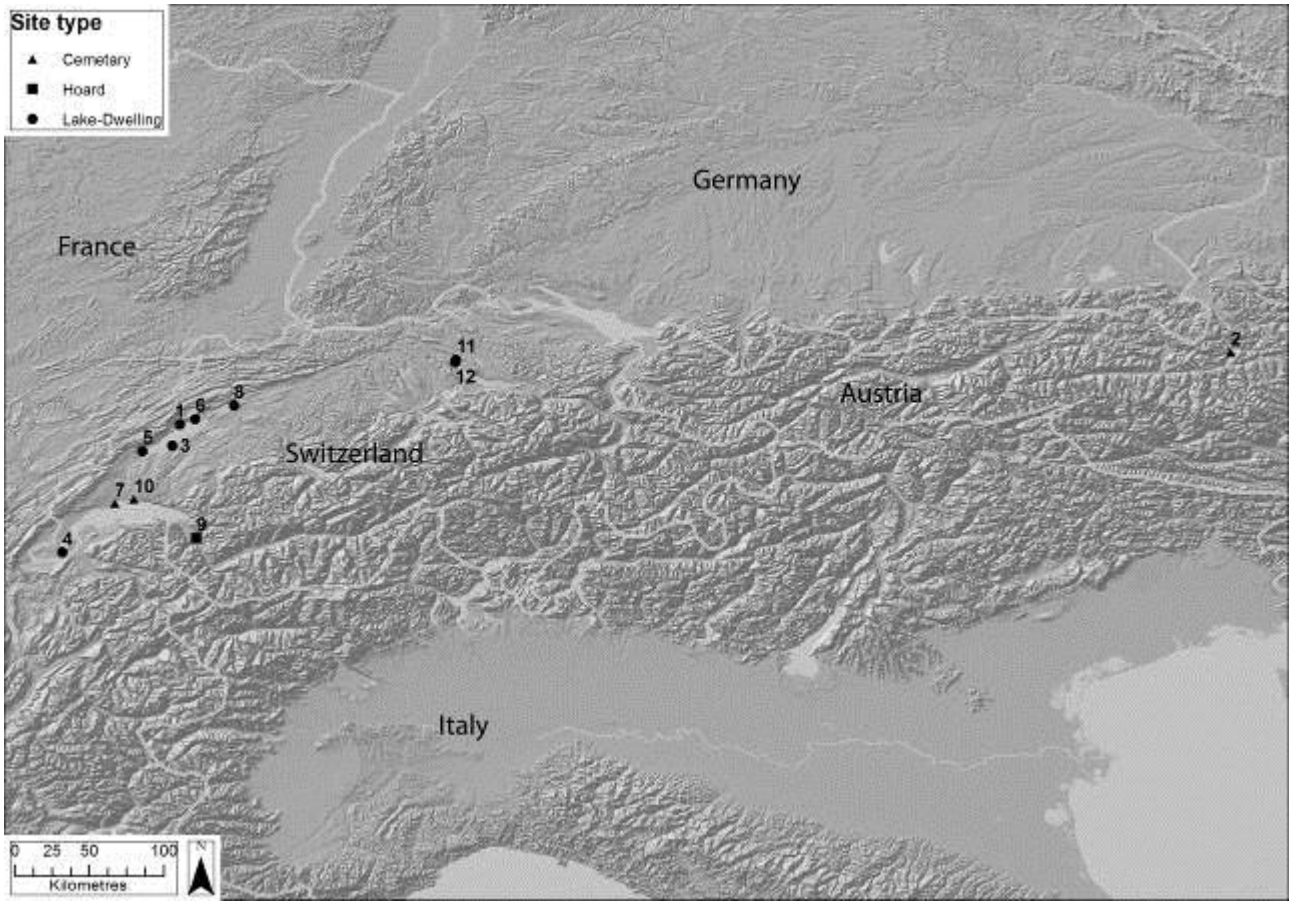

Figure 2. *Main sites mentioned in the article text. 1 Auvernier-Nord (Lake Neuchâtel); 2 Bischofshofen-Pestfriedhof; 3 Font - La Pianta (Lake Neuchâtel); 4 Genf-Eaux Vives (Lake Geneva); 5 Grandson-Corcelettes (Lake Neuchâtel); 6 Hauterive-Champréveyres (Lake Neuchâtel); 7 Le Boiron; 8 Mörigen (Lake Biel); 9 Ollon-Charpigny; 10 Vidy-Chavannes; 11 Zürich-Grosser Hafner (Lake Zurich); 12 Zürich-Wollishofen Haumesser (Lake Zurich).*

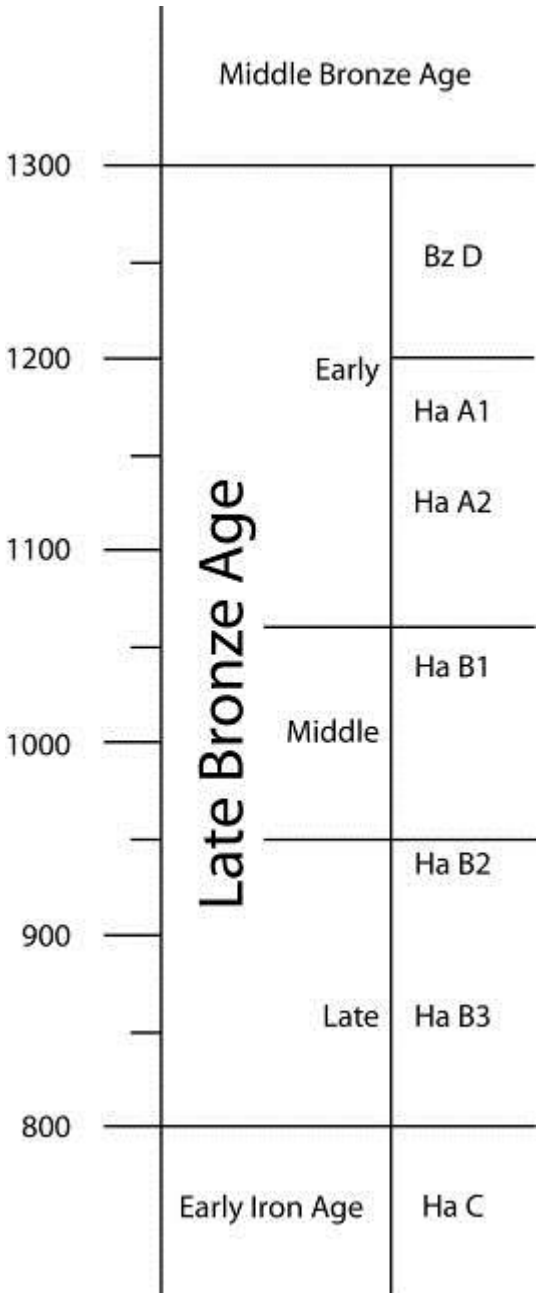

Figure 3. *Chronological terminology and equivalent dates used in the northern Circum-Alpine region. (Data after Rychner 1998 and Seifert 1997).*

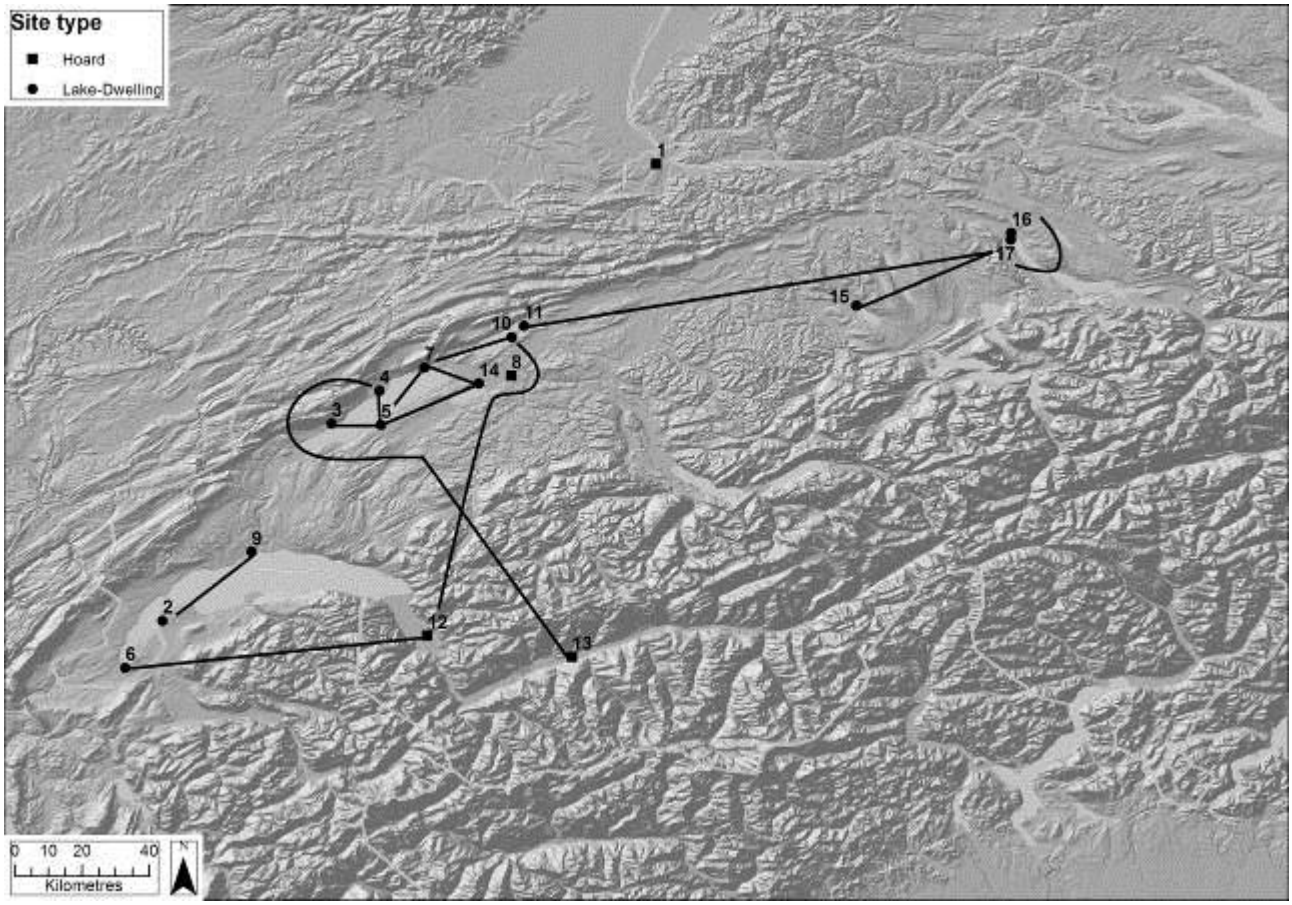

Figure 4. *Distribution of objects with sufficient similar impurities to be considered as having been manufactured in the same cast objects with sufficiently similar copper elements to be considered as being manufactured from the same ingot. Objects found at the same site denoted by (i) after site name. 1 Basel-Elisabethenschanze (i); 2 Chens-sur-Léman; 3 Concise; 4 Cortaillod; 5 Estavayer-le-Lac; 6 Genf-Eaux Vives; 7 Hauterive-Champréveyres (i); 8 Kerzers (i); 9 Morges (i); 10 Mörigen; 11 Nidau; 12 Ollon-Charpigny (i); 13 Sion – Kapuzinerkloster; 14 Sugiez; 15 Sursee – Zellmoos (i); 16 Zürich-Alpenquai (i); 17 Zürich-Wollishofen. (Data from Rychner & Kläntschi 1995).*

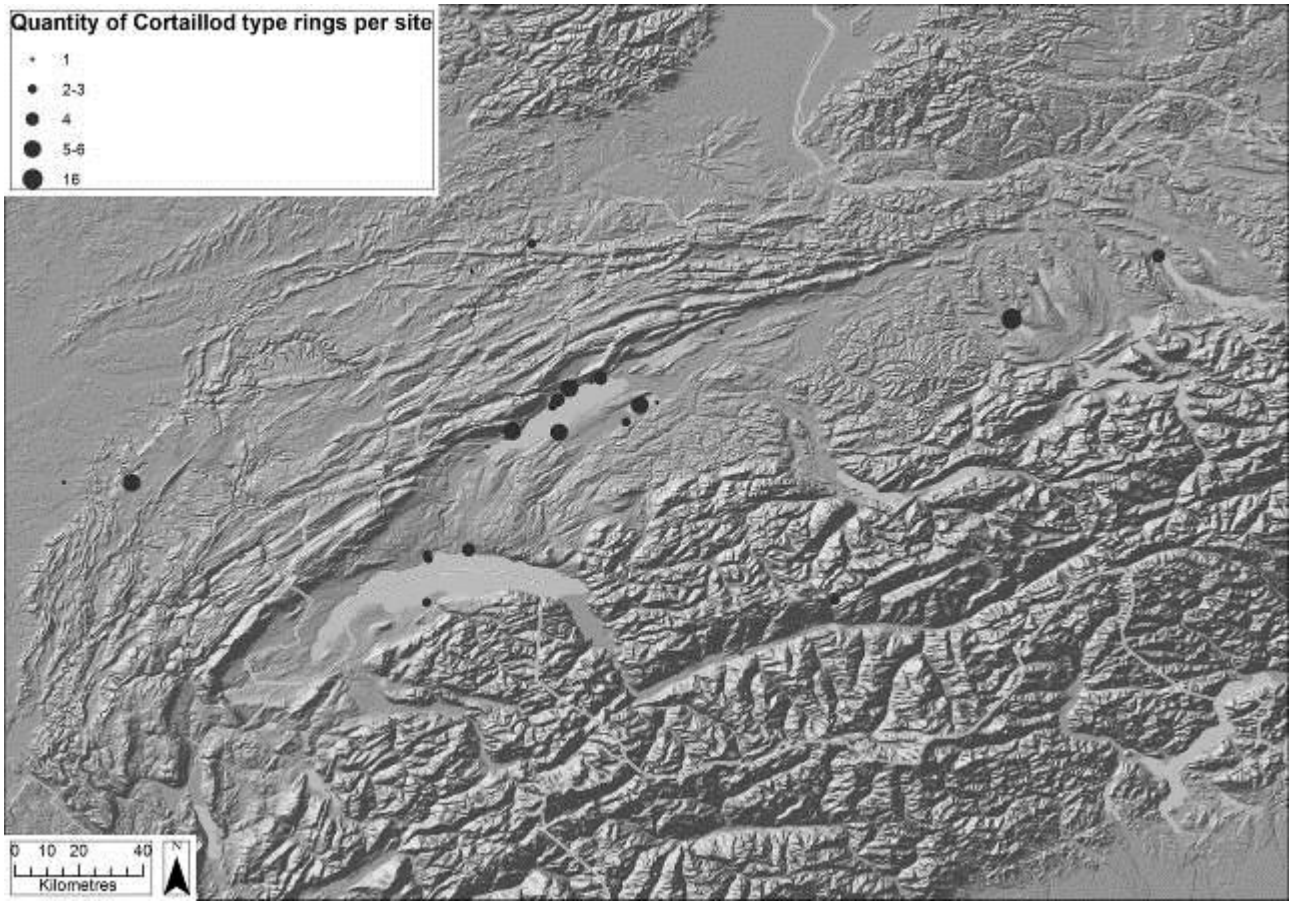

Figure 5. *Distribution of Cortaillod type ring jewellery. (Data from Pászthory 1985).*

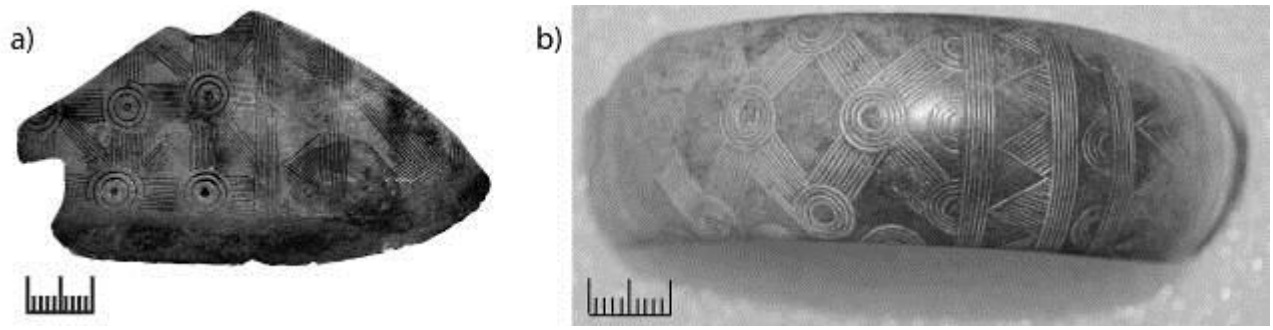

Figure 6. *Decoration on a) a converted ring-razor from Mörigen (Swiss National Museum no. 9192), and b) Corcelettes type arm-/leg-ring from Basel-Elisabethenschanze (Historical Museum Basel no. I21431). Scale length: 10mm. Photographs by the Author.*

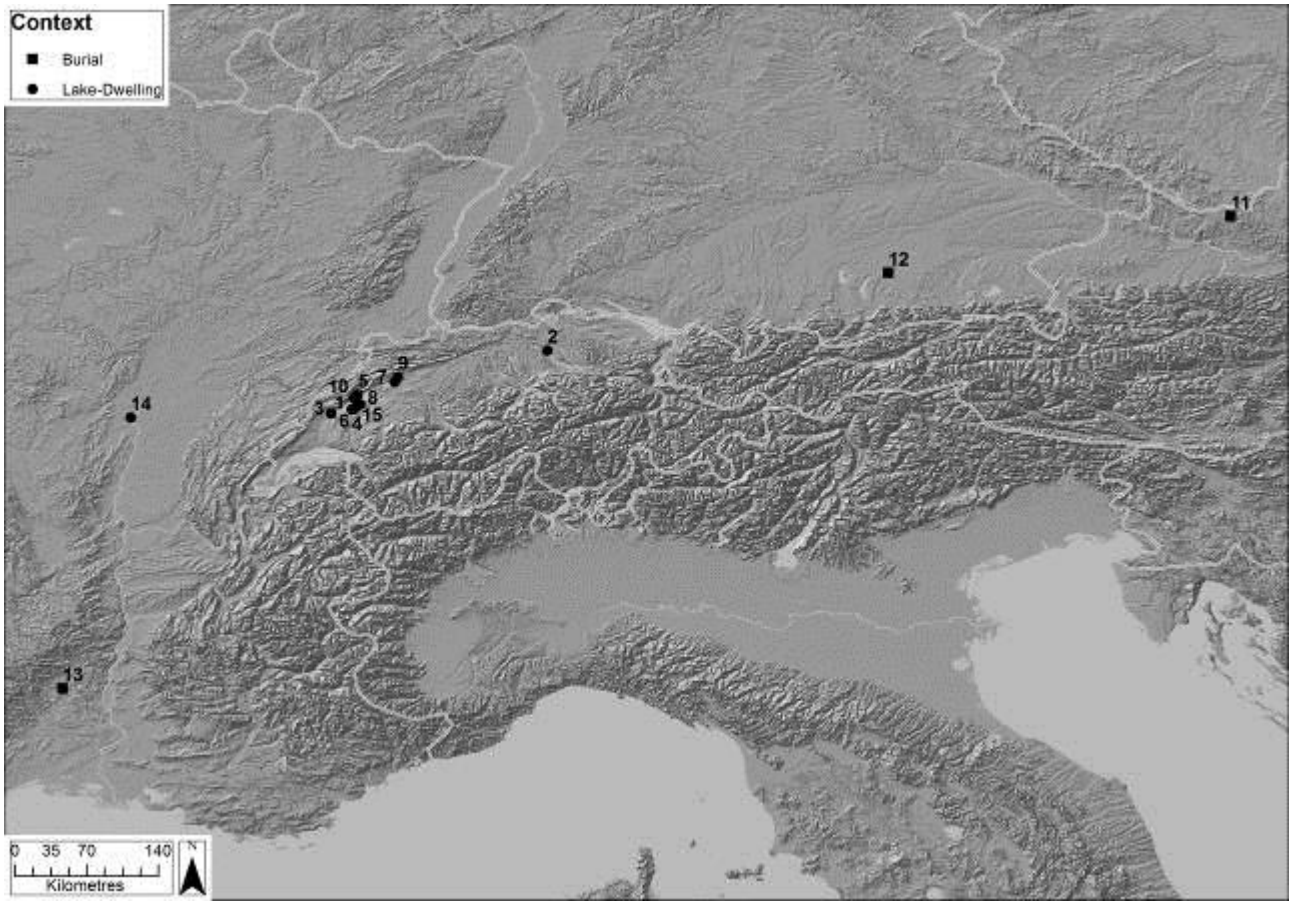

Figure 7. *Distribution of Boiron type rings. Converted ring-razor from Auvernier marked with hollow thick lined square. (Data from Pászthory 1985 and Jockenhövel 1971).*

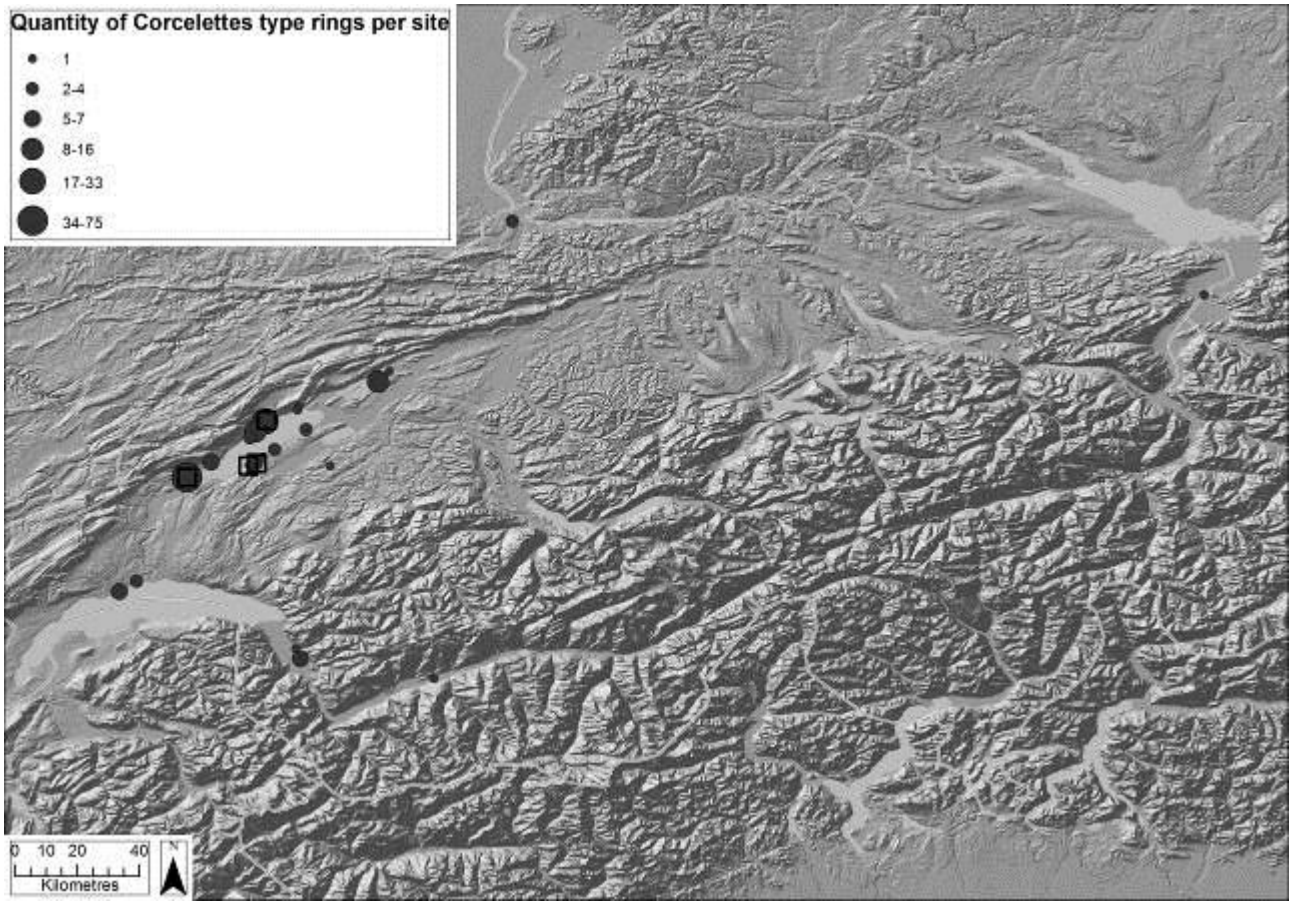

Figure 8. *Distribution of Corcelettes type rings within Switzerland. Converted ring-razors from Auvernier, Font-La Trabatiez, Grandson-Corcelettes and Estavayer-le-Lac marked with squares. (Data from Pászthory 1985 and Jockenhövel 1971).*

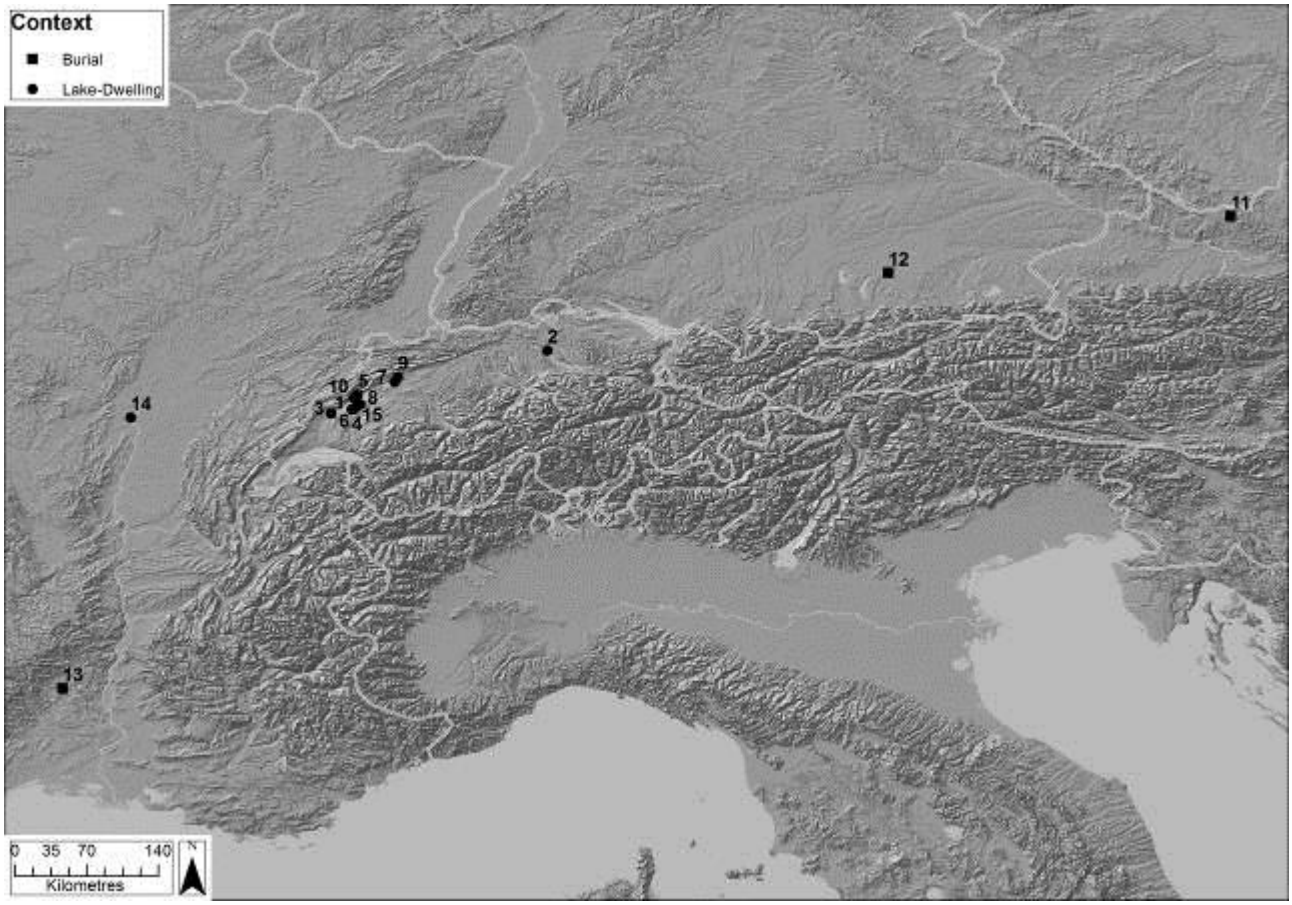

Figure 9. *Distribution of razors of types remanufactured from arm-/leg-rings or other objects, repaired arm-/leg-rings, and partially molten ring jewellery. Numbers refer to Table 1. (Data from Jockenhövel 1971; Jockenhövel 1980; and Pászthory 1985)*

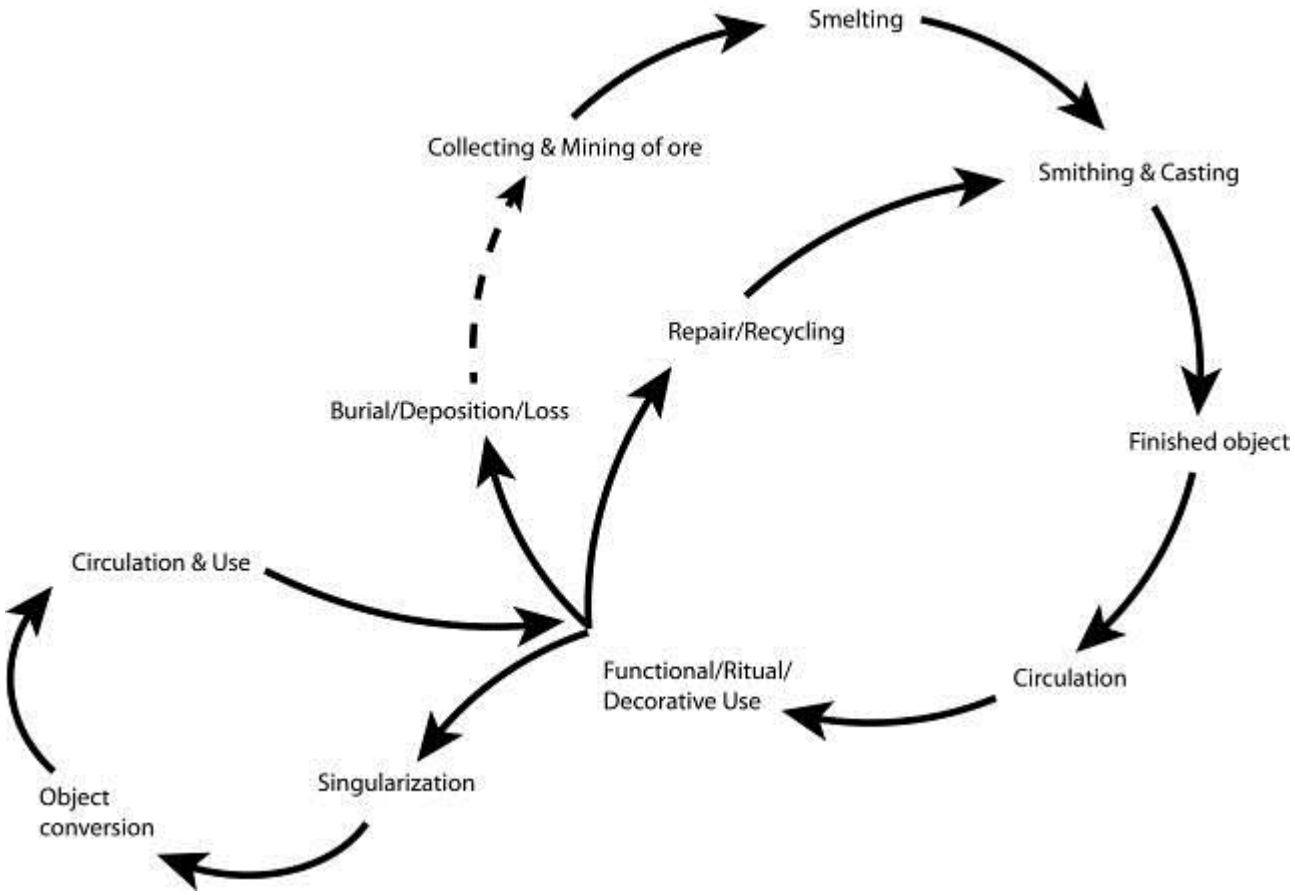

Figure 10. *Expansion of the 'biographical' model of metalwork to account for the potential influence and effects of the extraction of material through processes of 'singularization'.*

Site No.	Object type	Site	Object variant	References	Parent Object
1	Molten Ring Jewellery	Font-La Pianta (CH)	Estavayer-le-Lac	(Pászthory 1985, 620; Jockenhövel 1971, 445)	
1	Molten Ring Jewellery	Font-La Pianta (CH)	Estavayer-le-Lac	(Pászthory 1985, 621)	
2	Molten Ring Jewellery	Zurich-Grosser Hafner (CH)	Vinelz	(Pászthory 1985, 1032)	
3	Molten Ring Jewellery	Gandson-Corcelettes (CH)	Corcelettes	(Pászthory 1985, 1420)	
3	Molten Ring Jewellery	Gandson-Corcelettes (CH)	Corcelettes	(Pászthory 1985, 1421)	
3	Molten Ring Jewellery	Gandson-Corcelettes (CH)	Gerippte	(Pászthory 1985, 1676)	
3	Molten Ring Jewellery	Gandson-Corcelettes (CH)	Gerippte	(Pászthory 1985, 1677)	
3	Converted Razor	Gandson-Corcelettes (CH)	Tétin	(Pászthory 1985, 1422; Jockenhövel 1971, 445)	Corcelettes ring
4	Converted Razor	Font-La Trabatiez (CH)	Corcelettes	(Pászthory 1985, 1423)	Corcelettes ring
5	Converted Razor	Auvernier (CH)	Auvernier	(Pászthory 1985, 1424; Jockenhövel 1971, 473)	Corcelettes ring
5	Converted Razor	Auvernier (CH)	Mörigen	(Pászthory 1985, 1425; Jockenhövel 1971, 426a)	Corcelettes ring
6	Converted Razor	Estavayer-Le Lac (CH)	Atypical	(Pászthory 1985, 1426; Jockenhövel 1971, 562)	Corcelettes ring
5	Converted Razor	Auvernier (CH)	Trapeze without handle	(Pászthory 1985, 1444; Jockenhövel 1971, 517)	Boiron ring
5	Converted Razor	Auvernier (CH)	Atypical	(Jockenhövel 1971, 557)	Plate work
7	Converted Razor	Mörigen (CH)	Atypical	(Jockenhövel 1971, 558)	Plate work

8	Converted Razor	Chevroux (CH)	Atypical	(Jockenhövel 1971, 559)	Plate work
4	Converted Razor	Font-La Trabatiez (CH)	Atypical	(Jockenhövel 1971, 560)	Plate work
3	Converted Razor	Grandson-Corcelettes (CH)	Atypical	(Jockenhövel 1971, 561)	Plate work
3	Old material Razor	Grandson-Corcelettes (CH)	Atypical	(Jockenhövel 1971, 564)	Plate work
7	Old material Razor	Mörigen (CH)	Atypical	(Jockenhövel 1971, 565)	Plate work
9	Old material Razor	Nidau-Steinberg (CH)	Atypical	(Jockenhövel 1971, 566)	Plate work
10	Old material Razor	Cortaillod	Atypical	(Jockenhövel 1971, 566a)	Plate work
7	Old material Razor	Mörigen (CH)	Atypical	(Jockenhövel 1971, 568)	Plate work?
9	Old material Razor	Nidau-Steinberg (CH)	Atypical	(Jockenhövel 1971, 569)	Plate work
6	Old material Razor	Estavayer-Le Lac (CH)	Atypical	(Jockenhövel 1971, 569a)	Plate work
N/A	Old material Razor	West Switzerland	Atypical	(Jockenhövel 1971, 570)	Arm ring?
N/A	Old material Razor	West Switzerland	Atypical	(Jockenhövel 1971, 571)	Plate work
7	Old material Razor	Mörigen (CH)	Atypical	(Jockenhövel 1971, 571a)	Plate work
11	Old material Razor	Grünbach (AT)	2 sided razor	(Jockenhövel 1971, 363)	Dagger
12	Old material Razor	Grünwald (AT)	2 sided razor	(Jockenhövel 1971, 362)	Belt buckle
7	Old material Razor	Mörigen (CH)	Auvernier	(Jockenhövel 1971, 486)	Corcelettes ring
3	Old material Razor	Grandson-Corcelettes	Halfmoon without handle	(Jockenhövel 1971, 529)	Auvernier ring?
13	Old material Razor	Grospierres (F)	2 sided razor	(Jockenhövel 1980, 431)	2 sided ornament
14	Old material Razor	Saint-Marcel/Epervans (F)	Atypical	(Jockenhövel 1980, 557)	2 sided ornament
N/A	Old material Razor	Rhone Valley (F)	2 sided razor	(Jockenhövel 1980, 240)	Ornament
N/A	Old material Razor	France	2 sided razor	(Jockenhövel 1980, 241)	Ornament
N/A	Old material Razor	France	2 sided razor	(Jockenhövel 1980, 242)	Ornament
3	Repaired Ring Jewellery	Grandson Corcelettes (CH)	Corcelettes	(Pászthory 1985, 1254)	-
3	Repaired Ring Jewellery	Grandson Corcelettes (CH)	Corcelettes	(Pászthory 1985, 1361)	-
3	Repaired Ring Jewellery	Grandson Corcelettes (CH)	Morigen	(Pászthory 1985, 1623)	-
5	Repaired Ring Jewellery	Auvernier (CH)	Morigen	(Pászthory 1985, 1632)	-
15	Repaired Ring Jewellery	Estavayer (CH)	Morigen	(Pászthory 1985, 1636)	-
N/A	Repaired Ring Jewellery	N/A	Morigen	(Pászthory 1985, 1641)	-
3	Repaired Ring Jewellery	Grandson Corcelettes (CH)	Morigen	(Pászthory 1985, 1643)	-
3	Repaired Ring Jewellery	Grandson Corcelettes (CH)	Morigen	(Pászthory 1985, 1668)	-
3	Repaired Ring Jewellery	Grandson Corcelettes (CH)	Morigen	(Pászthory 1985, 1671)	-

Table 1. *List of repaired ring jewellery, razors manufactured from other objects, and half-molten ring jewellery from Switzerland and neighbouring countries.*

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